Identification of metabolic biomarkers in cancer, from spin to diagnostic

Despite the improving imaging techniques, it remains challenging to predict the outcome immediately after targeted therapy of cancer. Previously, we identified in vivo metabolic biomarkers for breast cancer and brain tumor models, which can be used in an early predictive evaluation of treatment.

The aim of this project is to identify potential biomarkers for both accurate diagnostic and therapy monitoring in cancer models. The project is a multidisciplinary approach including biology, math, quantum physic and programming. Master student will start with quantum simulation of metabolite resonances detectable by magnetic resonance spectroscopy (MRS). The results from simulation will be further evaluated by applying multiple MR modalities including MRS.

As been shown in Figure 1, two-dimensional MRS can detect a clinically relevant metabolite, 2-Hydroxyglutarate, in cancer cells of a glioma patient. Further evaluations on the role of this metabolite in oncology, researchers have demonstrated its increased accumulation in glioma patients with longer survival and with identical clinical behaviors. This example and many other reports have shown that in vivo investigations of MRS can greatly impact on clinical management of cancer patients. This project is for students with interests in learning medical imaging, MR spectroscopy, and molecular MR imaging.

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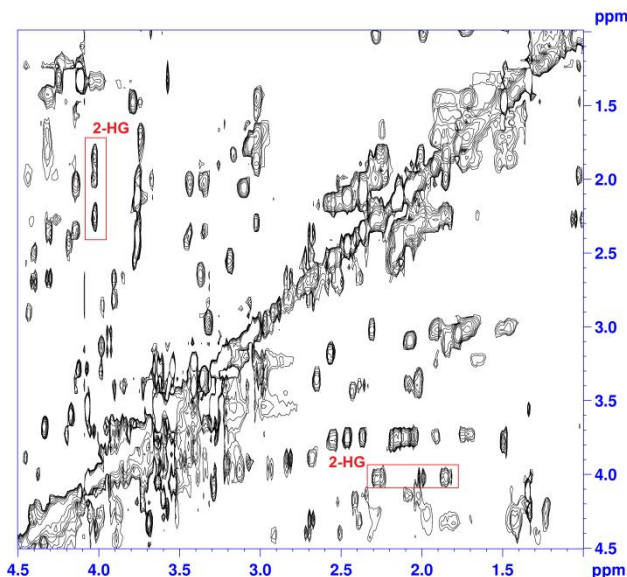Email: m.esmaeili@ntnu.no   Mobil: 45122970

Figure 1. Detection of 2-Hydroxyglutarate with 2D MRS of a glioma cancer cell with isocitrate dehydrogenase mutation.